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(54) Dispenser

(57) A dispenser for flowable material, for example in liquid or powder form, has a reservoir (1), a metering chamber (2) beneath the reservoir and a mixing chamber (4). A normally open valve (8) is provided between the reservoir and the metering chamber and a normally closed valve (11) between the metering and the mixing chambers. In use the states of the valves are reversed to admit material from the metering chamber to the mixing chamber, and a liquid is introduced under pressure into the latter to carry the material from an outlet. The valves then revert to their original states to permit a fresh charge of material to be fed from the reservoir into the metering chamber.

The dispenser may be used to introduce metered amounts of soap

or detergent either in liquid or powdered form in the wash drum of an automatic washing machine.

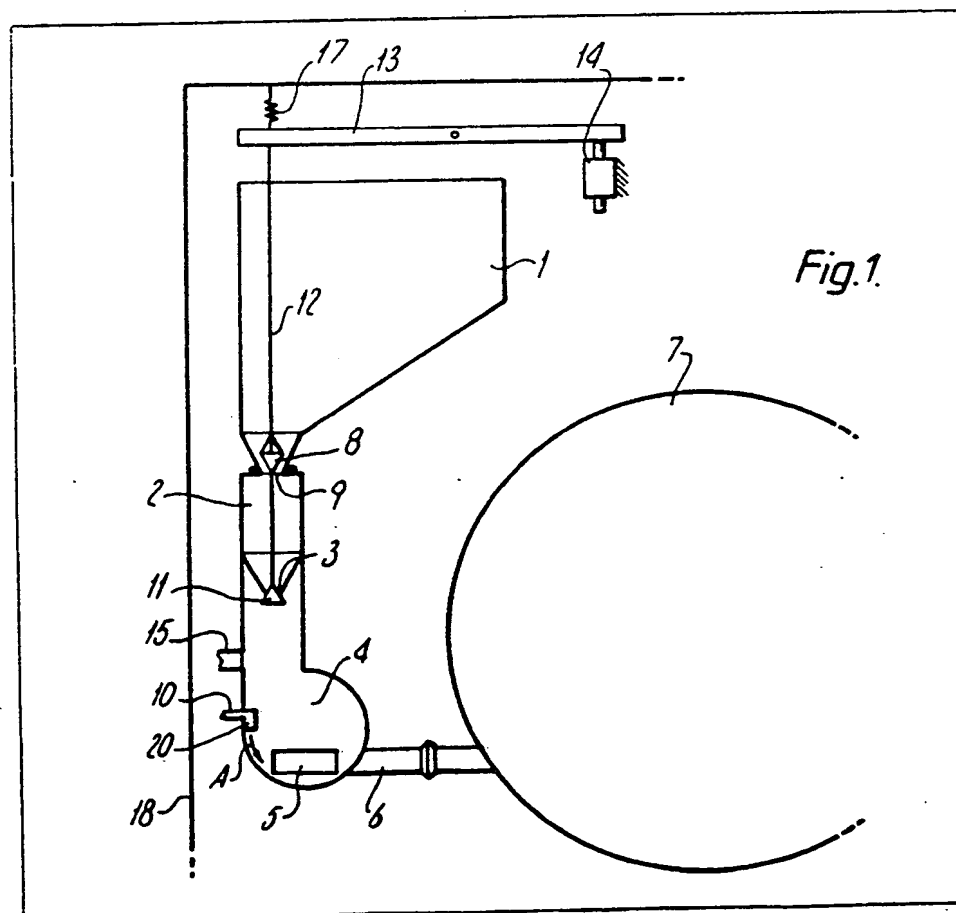
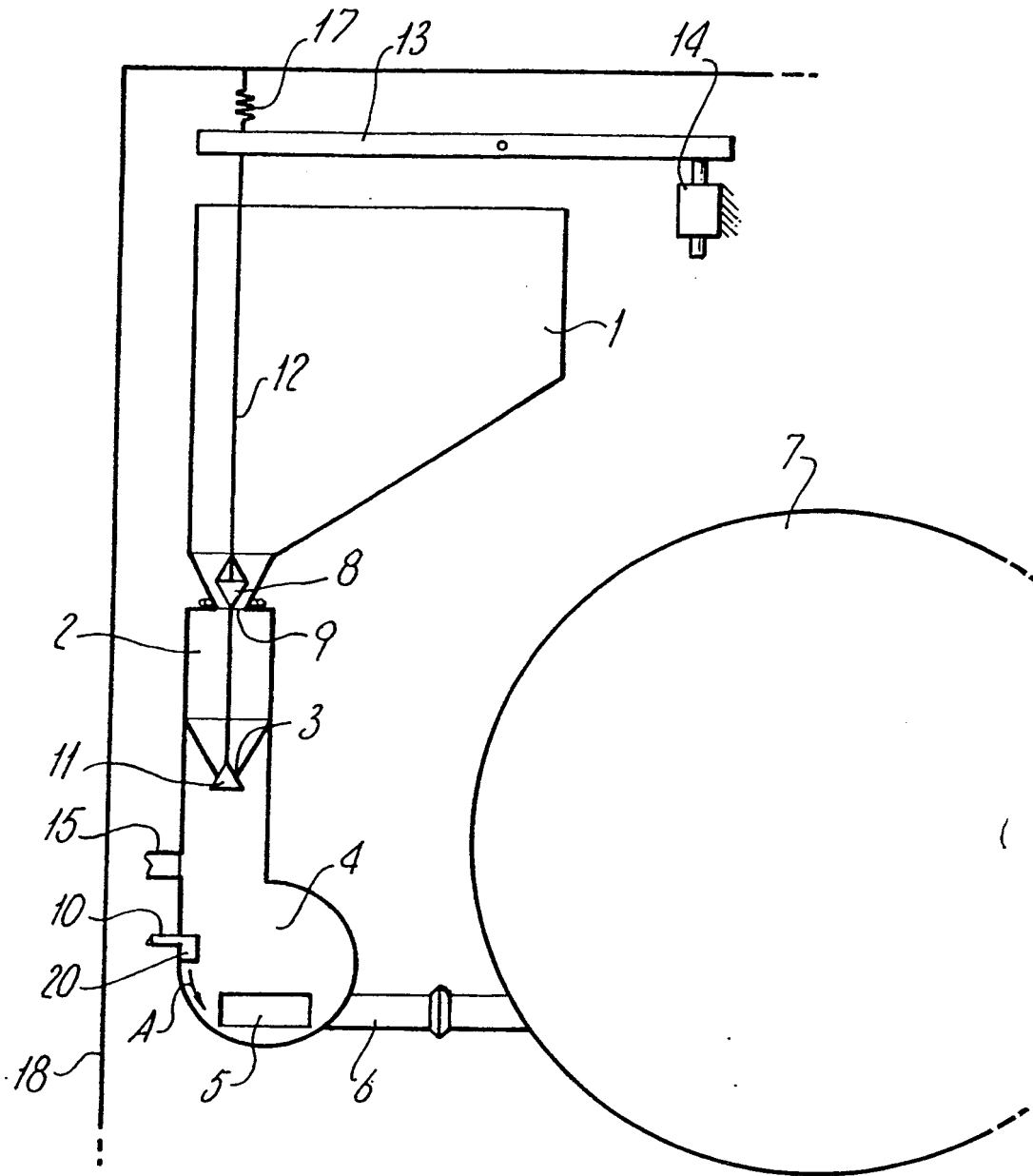


Fig. 1.

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Fig.1.



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Fig.2.

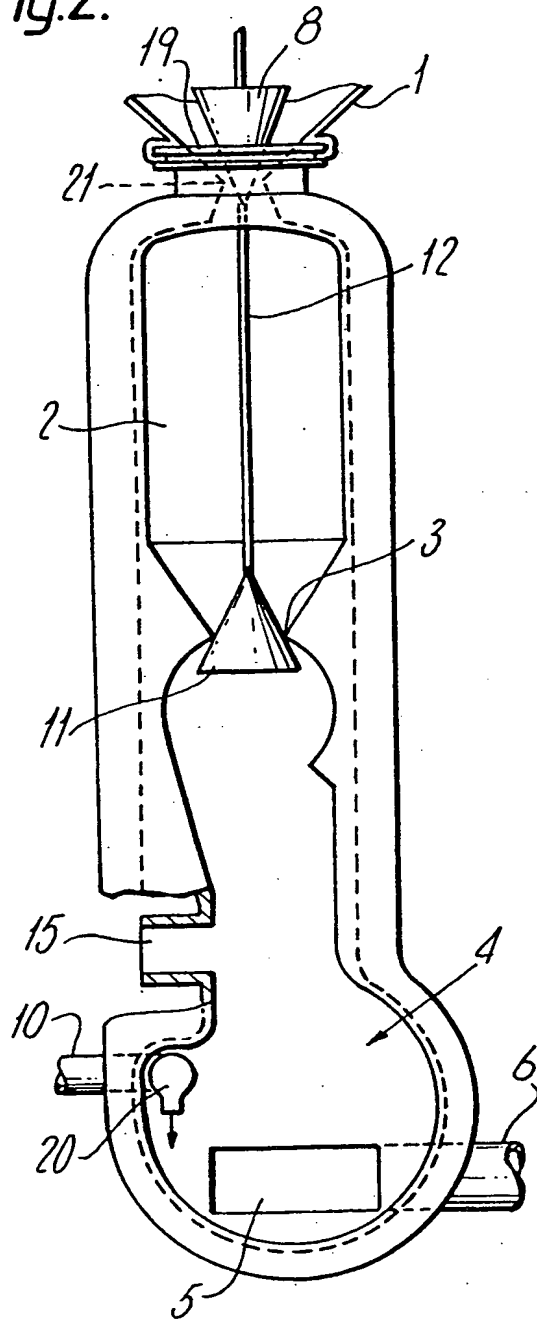
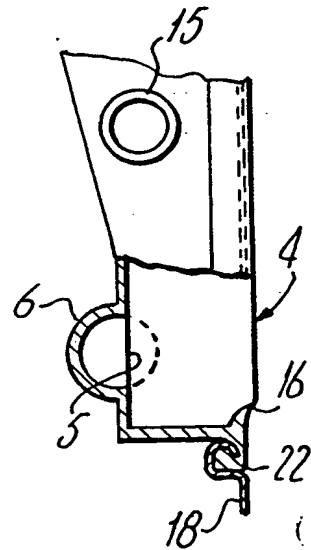


Fig.3.



SPECIFICATION

Dispenser

5 This invention relates to a dispenser for discharging metered amounts of a flowable material, either a liquid or a particulate solid material such as a free-flowing powder, and is especially, though not exclusively, concerned with the introduction of soap or detergent in liquid or powdered form from a reservoir into the wash drum of an automatic clothes washing machine.

10 In such an application it is desirable for the soap or detergent, hereinafter referred to simply as detergent, to be fed into the wash drum in a flow of water, and an object of the invention is to provide a form of dispenser suitable for such a purpose.

20 However the invention can also be used to advantage for other applications where metered amounts of flowable material are required to be dispensed in a like manner.

25 According to the invention a dispenser for flowable material comprises a reservoir for containing a supply of said material, a metering chamber beneath the reservoir into which the material can be fed under gravity, a mixing chamber beneath the metering chamber into which the material can be fed from the metering chamber under gravity, first and second valve means between the reservoir and the metering chamber and between the metering chamber and the mixing chamber respectively for controlling the passage of material, the first valve being normally open and the second valve being normally closed, means for closing the first valve and opening the second valve, and means for introducing liquid under pressure into the mixing chamber in a direction which produces a swirling action of the liquid around the mixing chamber and an outlet from the mixing chamber.

40 In use the material will be discharged from the reservoir through the open first valve into the metering chamber but will be prevented from discharging into the mixing chamber by the closed second valve. When the first valve is closed and the second valve is opened the contents of the metering chamber will discharge into the mixing chamber from which it will be carried, by the passage of said liquid, hereinafter referred to as the feed liquid, through the outlet, further material being prevented from being discharged from the reservoir by the closure of the first valve. On the subsequent closure of the second valve and the opening of the first valve a fresh charge of material will be discharged into the metering chamber in readiness for the operation to be repeated.

50 Preferably the valves are mechanically linked so that they can be actuated simultaneously.

65 The volume of the metering chamber will

thus determine the amount of flowable material dispensed, and by selecting the size of the chamber, and the number of operations, the amount of material discharged can readily be controlled.

70 The mixing chamber is conveniently in the form of a volute disposed with its axis horizontal, and the feed liquid is arranged to be injected into the chamber tangentially to the volute wall by means of a nozzle, thereby causing a swirl effect which assists in clearance the chamber of material discharged into it from the metering chamber.

75 For some purposes at least the injection of feed liquid into the mixing chamber may be initiated before the valves are operated to discharge material from the metering chamber into the mixing chamber. This, together with the swirling motion of the feed liquid, helps to prevent deposits of material being left within the mixing chamber.

80 Where the dispenser is used for feeding a particulate solid material and reservoir is conveniently in the form of a hopper, and in some cases to enhance the flow of material means may be provided for vibrating the hopper in use of the dispenser.

85 The invention is particularly applicable to automatic clothes washing machines and one form of dispenser for such a purpose will now be described by way of example with reference to Figs. 1 to 3 of the accompanying drawings, in which

100 *Figure 1* illustrates the dispenser in diagrammatic form, and

Figures 2 and 3 show part of the dispenser in more detail.

Referring first to *Fig. 1*, the dispenser is arranged to feed metered amounts of powdered detergent into the wash drum of the washing machine, and comprises a hopper 1 into which is arranged to be placed a store of detergent powder, the bottom of the hopper opening into a mainly cylindrical metering chamber 2 disposed with its axis vertical. The lower end of the metering chamber is in the form of an inverted cone which terminates in a discharge orifice 3. The outer walls of the metering chamber 2 are continued downwards and join a mixing chamber 4 in the form of a volute with its axis horizontal, the mixing chamber having an outlet opening 5 in its rear surface which communicates through a pipe 6 with the wash drum 7 of the washing machine, the wash drum containing, in the usual way, an inner perforated drum (not shown) arranged to rotate at a relatively slow speed for washing and rinsing and at a higher spin speed for extracting moisture from the clothes at appropriate times in the wash programme.

120 A pipe 10 extends into the mixing chamber 4 and terminates in a downwardly directed nozzle 20 close to the chamber wall.

130 A valve 8 in the form of an inverted cone is

arranged to seat in the outlet orifice 9 of the hopper 1 and a further conical valve 11 normally closes the discharge orifice 3 of the metering chamber, the valves being linked by a vertical push-rod 12 connected at its upper end to a solenoid-operated lever 13 pivotable about a horizontal axis. The end of the lever 13 to which the push-rod 12 is connected is biased upwards by a tension spring 17 to hold the valve 8 normally open and the valve 11 normally closed.

While the valves 8, 11 are in this position the detergent powder is free to fall from the hopper 1 into the metering chamber 2 until the latter is full.

At the beginning of a washing cycle a water valve (not shown) in the pipe 10 is opened to cause water to be discharged in a tangential direction as indicated by the arrow A into the mixing chamber 4 through the nozzle 20, the water swirling around the mixing chamber 4 and discharging into the wash drum 7 through the outlet opening 5 and the pipe 6.

After a predetermined length of time, sufficient to ensure that the sump of the machine is full of clean water, an electrical signal is sent to the solenoid 14, which causes it to rotate the lever 13 in the direction which produces a downward movement of the push-rod 12.

This has the effect of pushing the valve 8 on to its seat and simultaneously pushing the valve 11 off its seat. The detergent powder in the metering chamber 2 then falls into the water which is flowing in a turbulent manner through the mixing chamber 4, and is thereby mixed with the water which carries it into the wash drum 7. After a suitable predetermined time interval to allow the metering chamber 2 to empty, the solenoid 14 is de-energised causing the valves 8, 11 to revert to their rest positions by virtue of the spring bias, thereby enabling the metering chamber 2 to refill with detergent powder from the hopper 1.

The sequence of operations of the solenoid 14 is then repeated a sufficient number of times for the metering chamber 2 to provide the volume of powder required for the washing machine programme selected.

Once the level of liquid in the wash drum 7 rises above the outlet opening 5 of the mixing chamber 4 the swirling effect of the water injected into the mixing chamber tends to increase, which assists in clearing any residual powder which has not already been carried from the mixing chamber 4. Moreover the rise of liquid in the chamber will serve to cleanse the walls of the chamber of any powder which may have collected on it above the initial water line.

An overflow pipe as at 15 is provided just above the main part of the mixing chamber 4 to carry any surplus liquid away, either to the drum 7 or to a drain, should the main feed pipe 6 to the wash drum 7 become blocked;

in this way the liquid is prevented from entering the metering chamber 2.

Operation of the washing machine may, for example, involve 3, 4 or even 5 measured charges of powder in say " $\frac{1}{2}$ -cup" quantities as normally used in washing machine dispensers of known kind, depending upon the washing programme selected.

An advantage of utilising a dispenser in accordance with the invention in a washing machine is that a fresh charge of detergent powder does not need to be measured and introduced manually into machine for each washing operation, the appropriate amounts of powder being fed into the drum automatically in accordance with the washing programme selected.

The metering chamber 2 and the mixing chamber 4 are conveniently formed as a single unit, for example as a rubber moulding open at the front and as shown in more detail in Figs. 2 and 3, the edge of the moulding being provided with a sealing lip 16 and fixing bead 22 which enables it to be fixed into an appropriately shaped hole in the front panel of the washing machine cabinet 18. A door (not shown) is then provided on the outside of the panel to seal against the sealing lip 16 when the door is closed, the door thus providing the front wall of the metering chamber/mixing chamber unit in use of the dispenser. By opening the door an operator is enabled to clean the mixing chamber of accumulated powder should this be required.

The upper end of the moulding is suitably shaped as at 19 for connection to the hopper 1 and to provide the circular line seating as at 21 for the valve 8.

The metering chamber/mixing chamber unit may incorporate a liquid level detector (not shown) set in a pressure chamber suitably formed into the moulding.

The hopper 1 may also incorporate a level sensing system for monitoring the level of detergent powder and arranged to give an output signal for operating an indicator should the level of powder fall below a predetermined level; such an arrangement could for example make use of a light source and a photo sensitive detector, but any suitable form of level detector could be employed.

A visual level indicator could also take the form of a transparent insert or window in the door through which the content of the metering chamber 2 may be viewed.

The equipment substantially as above described can also be utilised for feeding controlled quantities of a liquid detergent into the wash drum of the machine. In dispensers designed specifically for such a purpose the size of the metering chamber and the number of operations required to introduce the detergent into the wash drum can readily be selected to suit the amount of liquid needed, the volume of which will usually be less than that

of powder in view of its higher level of concentration.

- However conversion of the powder dispenser described to use with a liquid detergent
 5 may be effected by the introduction of a spacer, for example of plastics material, in the metering chamber to reduce its volume to a required value. The spacer could, for example, be inserted via the access normally used for
 10 cleaning purposes.

- Although the invention is mainly applicable to automatic clothes washing machines it can also be used to advantage in a number of other cases requiring a liquid or a powdered
 15 or like particulate material to be dispensed automatically in metered amounts.

- Although for some applications of the invention used for dispensing a solid particulate material means may be provided for vibrating
 20 the hopper and possibly also the metering chamber to assist in producing a free flow of powder, such means will not usually be required in the case of a washing machine, as dry detergent powder tends to flow freely, and
 25 this will normally be assisted by the inherent movements of the washing machine when in use.

CLAIMS

- 30 1. A dispenser for flowable material comprising a reservoir for containing a supply of said material, a metering chamber beneath the reservoir into which the material can be fed under gravity, a mixing chamber beneath
 35 the metering chamber into which the material can be fed from the metering chamber under gravity, first and second valve means between the reservoir and the metering chamber and between the metering chamber and the mixing
 40 chamber respectively for controlling the passage of material, the first valve being normally open and the second valve being normally closed, means for closing the first valve and opening the second valve, and means for
 45 introducing liquid under pressure into the mixing chamber in a direction which produces a swirling action of the liquid around the mixing chamber and an outlet from the mixing chamber.

- 50 2. A dispenser according to Claim 1 in which the valves are mechanically linked so as to be actuated simultaneously.

3. A dispenser according to Claim 1 or 2 wherein the mixing chamber is in the form of
 55 a volute disposed with its axis horizontal, and the feed liquid is arranged to be injected into the chamber tangentially to the volute wall by means of a nozzle, thereby causing a swirl effect which assists in clearing the chamber of
 60 material discharged into it from the metering chamber.

4. A dispenser according to Claim 1, 2 or 3 wherein the injection of feed liquid into the mixing chamber in use of the dispenser is
 65 initiated before the valves are operated to

discharge material from the metering chamber into the mixing chamber.

5. A dispenser in accordance with any preceding Claim for feeding a particulate solid
 70 material wherein the reservoir is in the form of a hopper.

6. A dispenser according to Claim 5 including means for vibrating the hopper.

7. An automatic clothes washing machine
 75 incorporating a dispenser according to any preceding Claim for introducing soap or detergent in liquid or powdered form from said reservoir into the wash drum of the machine.

8. A dispenser for an automatic clothes
 80 washing machine substantially as shown in and as hereinbefore described with reference to Figs. 1 to 3 of the accompanying drawing.

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